

Applicants also include a marked-up version of the amended claims and a clean version of all pending claims.

The substitute specification contains no new matter. The changes are supported from the original specification or constitute typographical and/or grammatical informalities, as explained on the following table.

IN THE DESCRIPTION

| <u>Page Number/Line Numbers/Amendments</u> | <u>Support</u> |
|--|--|
| <u>PAGE 1</u> | |
| Lines 1-2 (the title), the words "HYDRODESULFURIZING DISTILLATES" have been deleted and the word --HYDROPROCESSING-- has been inserted therefor. | Page 28, Table |
| <u>PAGE 2</u> | |
| Line 4, the word "on-road" has been deleted and --proposed-- inserted therefor. | Page 1, line 24 |
| <u>PAGE 3</u> | |
| Line 3 bridging to line 5, the sentence, "One approach to prepare improved hydrotreating catalysts, is, a family of compounds, related to hydrotalcites, e.g., ammonium nickel molybdates, has been prepared." has been deleted and the sentence, --A family of compounds related to hydrotalcites, e.g., ammonium nickel molybdate, has been prepared as an approach to improved hydrotreating catalysts.-- has been inserted therefor. | No support required; grammatical informality |
| Lines 22-24, the paragraph beginning, "In accordance with..." is deleted and --In accordance with this invention there is provided a two stage hydroprocessing process comprising:-- is inserted therefor. | Page 28, Table |
| <u>PAGE 4</u> | |
| Line 1, the word "said" is deleted and --a-- is inserted therefor, and the word "hydrodesulfurization" is deleted and --hydroprocessing-- is inserted therefor. | Page 6, line 22 through Page 7, line 2; Page 8, lines 20 through 29; Page 27, lines 5 and 6 |
| Line 3, the phrase "each reaction zone" is deleted and --each first stage reaction zone-- is inserted therefor. | Page 8, lines 20-29 |

Line 4, the word "hydrodesulfurizing" is deleted and --hydroprocessing-- is inserted therefor, and the words "a hydrodesulfurization" are deleted and the phrase --at least one first stage hydroprocessing-- is inserted therefor.

Page 27, lines 5-6; Page 8, lines 20-20

Line 7, the word "hydrodesulfurization" is deleted and the word --hydroprocessing-- is inserted therefor.

Page 27, lines 5-6

Lines 11 and 12, the word "hydrodesulfurization" is deleted and the word --hydroprocessing-- is inserted therefor.

Page 27, lines 5-6

Lines 13 and 14, the word "hydrodesulfurization" is deleted and the word --hydroprocessing-- is inserted, the phrase "each reaction zone" is deleted and --each second stage reaction zone-- is inserted, and the phrase "a bed or hydrotreating" is deleted and --at least one second stage hydroprocessing-- is inserted therefor.

Page 8, lines 20-29

Lines 19 and 20, the phrase "of the reaction zones of at least on of said hydrodesulfurizing stages" is deleted and --second stage hydroprocessing catalyst-- is inserted therefor.

Page 8, lines 20-29

PAGE 5

Line 22, a --- has been inserted at the end of the sentence.

Obvious typographical error

PAGES 6 and 6-a

Line 5, the formula " $\text{NH}_4\text{-Ni}_{1.5}\text{Mo}_{0.5}\text{W}_{0.5}$ " has been deleted and $\text{--Ni-Mo}_{0.5}\text{W}_{0.5}\text{-O--}$ has been inserted therefor.

Page 30, line 13

Line 12, the formula " $\text{NH}_4\text{-Ni-Mo}_{1-x}\text{-W}_x\text{-O}$ " has been deleted and the formula $\text{--Ni-Mo}_{1-x}\text{-W}_x\text{-O--}$ has been inserted therefor.

Obvious typographical error

Line 17, after the heading DETAILED DESCRIPTION OF THE INVENTION, a new paragraph commencing with --The invention is based in part on...-- has been inserted.

page 3, lines 11-15; Page 3, lines 16-19; page 5, line 9

Line 25, a --- has been inserted after the word "hydrogenation".

Obvious typographical error

PAGE 7

Line 15, the word "an" is deleted and --and-- inserted therefor.

Obvious typographical error

PAGE 8

Line 26, the phrase "can only" is deleted and --can contain only-- is inserted therefor.

Obvious typographical error

PAGE 9

Line 7, the words "isom enhanced" are deleted and --acid functionalized-- inserted therefor.

Page 5, line 22

PAGE 14

Line 14, the phrase "C, O. and/or H beside" has been deleted and --C, O, and/or H besides-- inserted therefor.

Obvious typographical error

PAGE 18

Line 4, a --.-- has been inserted after the word "shaping".

Obvious typographical error

Line 6, the symbol " μn " has been deleted and -- μm -- inserted therefor.

Obvious typographical error

Line 8, the formula "0.1 - 50 m" is deleted and --0.1 - 50 μm -- is inserted therefor.

Obvious typographical error

Line 9, the symbol " $\mu\mu\text{m}$ " has been deleted and -- μm -- inserted therefor.

Obvious typographical error

PAGE 20

Line 10, a --.-- has been inserted after "80%".

Obvious typographical error

PAGE 24

Line 7-8, the words "of any or both of the hydrodesulfurization stages" have been deleted.

Page 7, lines 6-7

Line 22, the words "metals" have been deleted and the word --metal-- inserted therefor.

Obvious typographical error

PAGE 25

Line 14, the word "remained" has been deleted and the word --retained-- has been inserted therefor.

Obvious typographical error

Lines 15 - 18, this sentence was reformatted to immediately follow the preceding paragraph on line 14.

Obvious typographical error

Lines 20 and 25, the terms "VIB" have been deleted and --via-- inserted therefor.

Obvious typographical error

Lines 26 and 27, the paragraph is indented, the words "the one" are deleted and --that-- inserted, the words "in particular" are deleted and --particularly-- inserted therefor.

Obvious typographical error

PAGES 26 AND 26-a

Line 6, the symbol " μ n" has been deleted and -- μ m-- inserted therefor.

Obvious typographical error

Line 23, the values "(4.09), 2.83, 2.54, 2.32, 2.23, 1.71, (1.54), 1.47" have been deleted and the values --(4.09Å), 2.83Å, 2.53Å, 2.32Å, 1.70Å, (1.54Å), 1.47Å-- have been inserted therefor, causing original page 26 to bridge to page 26-a.

Obvious typographical error

PAGE 27

Obvious typographical error

Line 4, the values "2.52, 1.72 and 1.46" have been deleted and the values 2.52Å, 1.72Å and 1.46Å-- have been inserted therefor.

PAGE 28

Page 6, lines 17-18; Page 5, line 22

Line 22, the term "HDN" is deleted and --HDN/HDS-- inserted, and the words "isom enhanced" are deleted and --acid functionalized-- inserted therefor, causing the words "advantages over co-" to bridge to page 29.

PAGE 29

Obvious typographical error

Line 2, the formula " NH_2 " is deleted and -- NH_3 -- inserted therefor.

Lines 10 and 20, the words "isom enhanced" are deleted and --acid functionalized-- inserted therefor.

Page 5, line 22

PAGE 30

Line 12, the word "Teichner" is deleted and --Teichner and Astier-- inserted therefor.

Page 29, line 26

Line 24, the words "Figure 2" have been deleted and the word --Figure 1-- have been inserted therefor.

Obvious typographical error

Line 25, the value " $d=2.58$ " has been deleted and the value -- $d=2.53$ -- inserted therefor.

Page 5, line 18 ✓

PAGE 31

Line 14, the formula " $\text{NH}_4\text{-Ni-Mo}_{.5}\text{W}_{.5}\text{-O}$ " has been deleted and the formula " $\text{--NH}_4\text{-Ni-Mo}_{.5}\text{-W}_{.5}\text{-O--}$ " has been inserted therefor.

Obvious typographical error

PAGE 35

Table 4, row 1, the word "ammoniu" has been realigned in the table to read " --ammonium-- ".

Obvious typographical error

PAGE 36

Line 11, the formula " Ni ," has been deleted and " --Ni-- " has been inserted therefor.

Obvious typographical error

Line 15, the formula " Ni ," has been deleted and " --Ni-- " has been inserted therefor.

Obvious typographical error

Line 19, " --/HDS-- " has been inserted following " HDN ".

Page 36, Table 5

PAGE 37

Line 9, the formula " NH_4OH " has been deleted and the formula " $\text{--NH}_4\text{OH--}$ " inserted therefor.

Obvious typographical error

Line 18, the words "Example 10 or 11" have been deleted and " --Example 10-- " inserted therefor.

Obvious typographical error

PAGE 38

Line 1, the words "Examples 12" have been deleted and " --Example 10-- " inserted therefor.

Obvious typographical error

Line 1, the word "mat" is deleted and the word " --that-- " inserted therefor.

Obvious typographical error

Line 5, the words "Examples 7 or 8" have been deleted and " --Example 10-- " inserted therefor.

Obvious typographical error

Line 10, the words "In Examples 7 or 8" have been deleted and " --in Example 10-- " inserted therefor.

Obvious typographical error

PAGE 39

Line 9, in the second formula, the term " MO_7 " has been deleted and the term " $\text{--Mo}_7\text{--}$ " has been inserted therefor.

Obvious typographical error

PAGE 40

Line 2, the word "convention" is deleted and --conventional-- inserted therefor.

Obvious typographical error

Table 6, column 1, the numbers "1a, 2a, 1b, 2b, 1c, 2c, 1d, 2d, 1e, 2e" are deleted and --20, 21, 20, 21, 20, 21, 20, 21, 20, 21-- inserted therefor.

Page 39, lines 20-21;
Page 40, lines 1-3

PAGES 40, 41 and 42

Additionally, the language at Page 40, line 27, through Page 42, line 17, has been cancelled as exemplifying a non-elected invention.

IN THE CLAIMSPAGE 43

Claim 1, lines 2-4, the term "hydrodesulfurizing" is deleted and --hydroprocessing-- is inserted, and the phrase "for reducing the sulfur content of distillate feedstocks having a sulfur content greater than about 3,000 wppm, which process comprises" is deleted and --comprising-- is inserted therefor.

Page 6, line 22 to Page 7, line 2

Lines 5-23, items a) through e) are deleted and replaced with new items a) through e).

Page 8, lines 20-29

Lines 24-25, the phrase "of the reaction zones of at least on of said hydrodesulfurizing stages contains" is deleted and --second stage hydroprocessing catalyst comprises-- is inserted therefor.

Page 8, lines 20-29

PAGE 44

Claim 5, the mark "\ " is deleted at the end of the sentence.

Obvious typographical error

NEW PAGES 44-a through 44-c

Claims 8 through 24 have been added. Support for these new claims is indicated below.

Claim 8

Page 28, Table

Claim 9

Page 28, Table; Page 6, line 20

Claims 10 through 14

Page 28, Table

| | |
|-----------------------|-------------------------------------|
| Claim 15 | Page 11, line 20 - Page 12, line 9 |
| Claim 16 | Page 12, line 16 |
| Claim 17 | Page 27, lines 5-6 |
| Claim 18 | Page 6, line 22 - Page 7, line 2 |
| Claim 19 | Page 8, line 20 - Page 9, line 10 |
| Claim 20 | Page 23, line 7 |
| Claims 21, 22, and 23 | Page 28, line 24 - Page 29, line 17 |
| Claim 24 | Page 7, lines 1-5 |

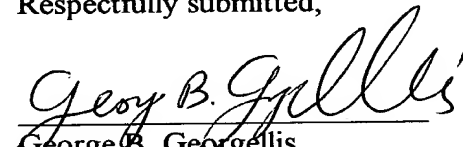
IN THE ABSTRACT

PAGE 45

Lines 1-2 (the title), the words
"HYDRODESULFURIZING DISTILLATES" have been
deleted and the word --HYDROPROCESSING-- has been
inserted therefor.

Page 28, Table

Respectfully submitted,


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☒ Pursuant to 37 CFR 1.34(a)

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MARKED-UP VERSION OF AMENDED CLAIMS

1. (amended) A two stage [hydrodesulfurizing] hydroprocessing process [for reducing the sulfur content of distillate feedstocks having a sulfur content greater than about 3,000 wppm, which process comprises] comprising:

[a) reacting a feedstream in a first hydrodesulfurization stage in the presence of a hydrogen-containing treat gas, said first hydrotreating stage containing one or more reaction zones, each reaction zone operated at hydrodesulfurizing conditions and in the presence of a hydrodesulfurization catalyst, thereby resulting in a liquid product stream having a sulfur content less than about 3,000 wppm;

b) passing the liquid product stream of said first hydrodesulfurization stage to a separation zone where a vapor phase product stream and a liquid phase product stream are produced;

c) reacting said liquid phase product stream of b) above in a second hydrodesulfurization stage in the presence of a hydrogen-containing treat gas said second hydrodesulfurization stage containing one or more reaction zones operated at hydrodesulfurization conditions wherein each reaction zone contains a bed of hydrotreating catalyst, thereby resulting in a liquid product stream having less than about 1,000 wppm sulfur;

d) passing the liquid product stream of step c) above to a separation zone wherein a vapor phase stream and a liquid phase stream are produced;

e) collecting both said vapor phase stream and said liquid phase stream; and]

a) reacting a feedstream in a first hydroprocessing stage in the presence of a hydrogen-containing treat gas, the first hydrotreating stage containing one or more reaction zones, each first stage reaction zone operated at first stage hydroprocessing conditions and in the presence of at least one first stage hydroprocessing catalyst, thereby resulting in a liquid product stream having a sulfur content less than about 3,000 wppm;

MARKED-UP VERSION OF AMENDED CLAIMS (continued)

b) passing the liquid product stream of the first hydroprocessing stage to a first separation zone where a first vapor phase product stream and a first liquid phase product stream are produced;

c) reacting the first liquid phase product stream of b) in a second hydroprocessing stage in the presence of a hydrogen-containing treat gas, the second hydroprocessing stage containing one or more second stage reaction zones operated at second stage conditions wherein each second stage reaction zone contains at least one second stage hydroprocessing catalyst;

d) passing the second liquid product stream of step c) to a second separation zone wherein a second vapor phase stream and a second liquid phase stream are produced; and

e) collecting both the second vapor phase stream and the second liquid phase stream;

wherein at least one [of the reaction zones of at least on of said hydrodesulfurizing stages contains] second stage hydroprocessing catalyst comprises a bulk multimetallic catalyst comprised of at least one Group VIII non-noble metal and at least two Group VIB metals and wherein the ratio of Group VIB metal to Group VIII non-noble metal is from about 10:1 to about 1:10.

5. (amended) The process of claim 3 wherein the molar ratio of c:d is preferably $>0.01/1$. [N]

MARKED-UP VERSION OF AMENDED CLAIMS (continued)New Claims:

- 8. The process of claim 1 wherein the feedstock is a hydrocarbon with a boiling point in the range of 25°C to 575°C, and wherein the first and second stage hydroprocessing conditions include a reaction temperature in the range of 100°C to 450°C, a pressure of 5 Bar to 1100 Bar, a space velocity of 0.5 V/V/Hr to 10 V/V/Hr, and a hydrogen gas treat rate of 100 SCF/B to 1,000 SCF/B.
9. The process of claim 1 wherein the feedstock comprises at least one of naphtha, diesel, heavy gas oil, lube oil, and residuum.
10. The process of claim 9 wherein the feedstock is naphtha boiling in the range of 25°C to 210°C, and the second stage hydroprocessing conditions include a reaction temperature of 100°C to 370°C, a pressure of 10 Bar to 60 Bar, a space velocity of 0.5 to 10 V/V/Hr, and a hydrogen gas treat rate of 100 SCF/B to 2,000 SCF/B.
11. The process of claim 9 wherein the feedstock is diesel boiling in the range of 170°C to 350°C, and the second stage hydroprocessing conditions include a reaction temperature of 200°C to 400°C, a pressure of 15 Bar to 110 Bar, a space velocity of 0.5 V/V/Hr to 4 V/V/Hr, and a hydrogen gas treat rate of 500 SCF/B to 6,000 SCF/B.
12. The process of claim 9 wherein the feedstock is heavy gas oil boiling in the range of 325°C to 475°C, and wherein the second stage hydroprocessing conditions include a reaction temperature of 260°C to 430°C, a pressure of 15 Bar to 170 Bar, a space velocity of 0.3 V/V/Hr, and a hydrogen gas treat rate of 1,000 SCF/B to 6,000 SCF/B.
13. The process of claim 9 wherein the feedstock is a lubricating oil boiling in the range of 290°C to 550°C, and wherein the second stage hydroprocessing conditions include a reaction temperature of 200°C to 450°C, a pressure of 6 Bar and 210 Bar, a space velocity of 0.2 V/V/Hr to 5 V/V/Hr, and a hydrogen gas treat rate of 100 SCF/B to 10,000 SCF/B.

14. The process of claim 9 wherein the feedstock is a residuum having a 10% to 50% boiling range of 575°, and wherein the second stage hydroprocessing conditions include a reaction temperature of 340°C to 450°C, a pressure of 65 Bar to 1100 Bar, a space velocity of 0.1 V/V/Hr to 1 V/V/Hr, and a hydrogen gas treat rate of 2,000 SCF/B to 10,000 SCF/B.

15. The process of claim 1 wherein the bulk multimetallic catalyst is in the form of particles having a median diameter of at least 50 nm, a surface area of at least 10 m²/gm, a pore volume ranging from 0.05 to 5 ml/g, and an absence of pores smaller than 1 nm.

16. The process of claim 14 wherein the bulk multimetallic catalyst particle has a core-shell structure.

17. The process of claim 1 wherein at least one of the first and second stage hydroprocessing catalyst further comprises a catalytically effective amount of a second catalyst.

18. The process of claim 17 wherein the second catalyst provides at least one of a desulfurization functionality, a denitrogenation functionality, an aromatics saturation functionality, a cracking functionality, and an isomerization functionality.

19. The process of claim 18 wherein for the stage(s) containing both the bulk multimetallic catalyst and the second catalyst that the second catalyst is located in at least one of:

- (i) a region upstream of the bulk multimetallic catalyst;
- (ii) a region containing the bulk multimetallic catalyst; and
- (iii) a region downstream of the bulk multimetallic catalyst.

20. The process of claim 1 wherein the bulk multimetallic catalyst is a sulfided catalyst.

MARKED-UP VERSION OF AMENDED CLAIMS (continued)

21. The process of claim 1 further comprising:

- (i) operating the first hydroprocessing stage in cocurrent mode;
- (ii) separating at least ammonia in the separation zone;
- (iii) operating the second hydroprocessing stage in countercurrent mode, wherein at least one second stage reaction zone contains an acid-functionalized hydrodesulfurization catalyst; and
- (iv) hydroprocessing the second vapor phase stream.

22. The process of claim 21 further comprising hydroprocessing the second vapor phase stream in the second stage.

23. The process of claim 21 further comprising condensing the second vapor phase stream and hydroprocessing the condensed second vapor phase stream in the first stage.

24. The method of claim 1 wherein the second stage hydroprocessing conditions are hydrodearomatization conditions. --